

1.4.6

EE24BTECH11058 - P.Shiny Diavajna

Question: If the point $P(2, 1)$ lies on the line segment joining points $A(4, 2)$ and $B(8, 4)$, then

Solution:

Variable	Description
$P(2, 1)$	Point on the line segment joining A and B
$A(4, 2)$	one end of the line segment AB
$B(8, 4)$	another end of the line segment AB

TABLE 0: Variables Used

$$\|A - B\| = \sqrt{(A - B)^\top (A - B)}$$

$$A = \begin{pmatrix} 4 \\ 2 \end{pmatrix} B = \begin{pmatrix} 8 \\ 4 \end{pmatrix}$$

$$(A - B) = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$$

$$(A - B)^\top = (-4 - 2)$$

$$AB = \sqrt{(-4 - 2) \begin{pmatrix} -4 \\ -2 \end{pmatrix}} = \sqrt{20} = 2\sqrt{5}$$

Similarly,

$$AP = \|A - P\| = \sqrt{(-2 - 1) \begin{pmatrix} -2 \\ -1 \end{pmatrix}} = \sqrt{5}$$

$$PB = \|P - B\| = \sqrt{(-6 - 3) \begin{pmatrix} -6 \\ -3 \end{pmatrix}} = \sqrt{45} = 3\sqrt{5}$$

Therefore,

$$AP = \frac{1}{2}AB$$

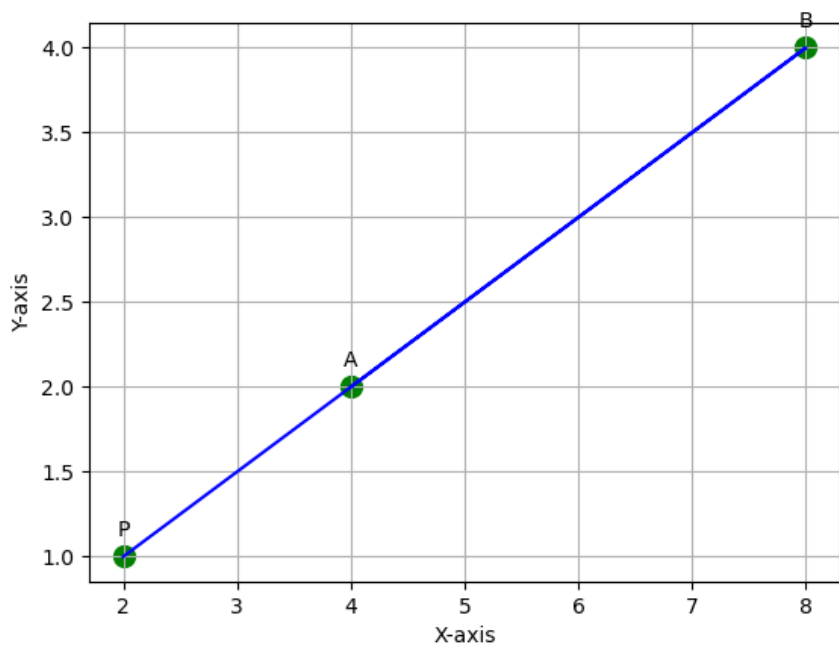


Fig. 0.1: Plot of Points A,B and P